



1 Water - Use It Wisely

2 Requirements

Optional

3 Calculator Computer with spreadsheet software
program (eg. Excel)
Internet connection

4

5 Background

It is vital that we use water wisely and respect it as a precious resource. Water is an essential part of our lives. It is important to be aware of how we use water and what we can do to assist with water conservation. Our environment is under great stress facing issues such as, decreasing river flows, soil salinity and deforestation.

Calculating the Actual Volume of Water Used

Volume of household water used per capita (kL) 1993-94 - 2011-12.

	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA
1993-94 (a)	np	np	194	131	89	67	93	126
1996-97 (a)	115	96	172	124	92	69	96	124
2000-01 (b)	115	97	162	143	110	125	97	191
2004-05 (b)	95	84	153	124	94	143	81	180
2008-09 (c)	76	78	173	79	80	137	62	150
2009-10 (c)	77	78	161	81	76	143	59	152
2010-11 (c)	68	73	134	69	70	135	56	132
2011-12 (c)	69	70	145	76	72	109	56	127

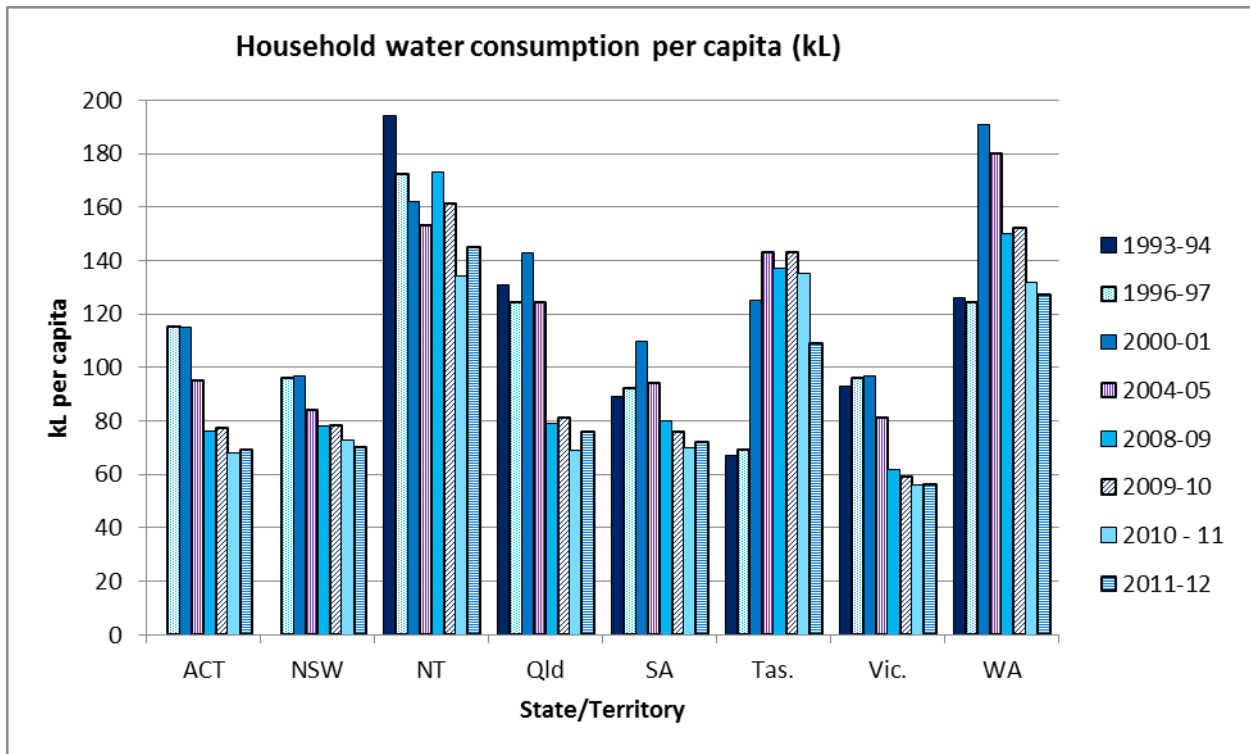
'Per capita' is another term for 'per person'.

Np - not available for publication

Table 1: Source: (a) Australian Bureau of Statistics, Water Account, Australia 2000-01, Table 9.6 (cat no. 4610.0) (b) Australian Bureau of Statistics, Water Account, Australia 2004-05, Table 7.7 (cat no. 4610.0) (c) Australian Bureau of Statistics, Water Account, Australia 2011-12, Summary Tables, Table 1 (cat no. 4610.0)

1. Draw a side-by-side column graph showing the volume of water consumed by each household, by state or territory by year. Include all years on one graph, using a different colour for each year.

This can be done efficiently by copying and pasting the table into an Excel spreadsheet and selecting "insert column graph". This is an example of a clustered column graph.

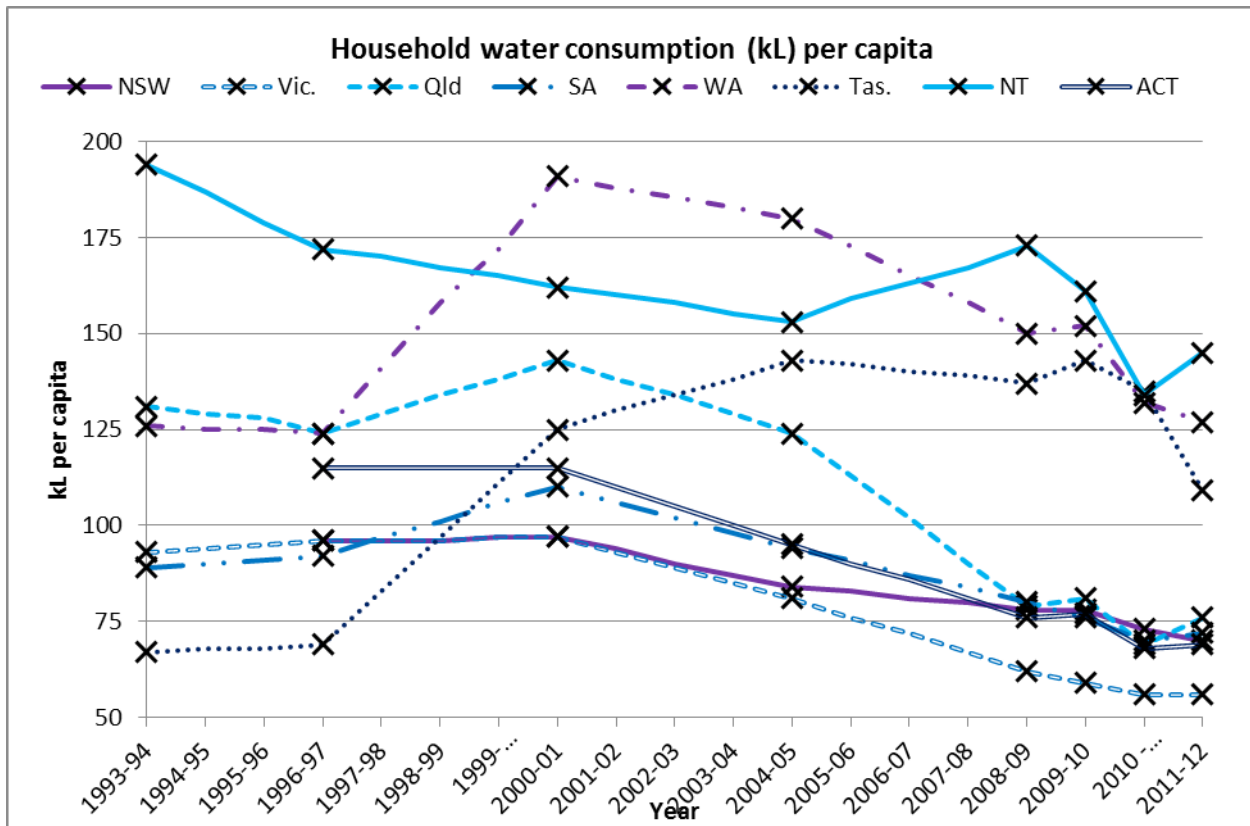


2. Comment on the change in the volume of water use over time.

All states show a reduction of water use over time. WA and NT are consistently high users of household water per person. Qld and WA show the greatest reductions in water over time from the maximum values in 2000-01. NSW and Vic use the least household water per person, and have reduced their consumption the least.

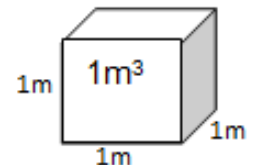
3. Graph the data in Table 1 using a display different to a side by side column graph. Label the graph and axes appropriately. Comment on the advantages and disadvantages of displaying data two different ways.

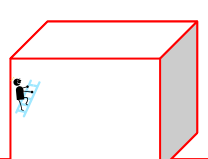
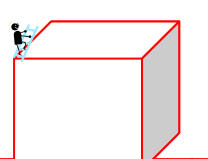
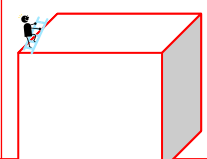
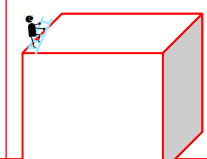
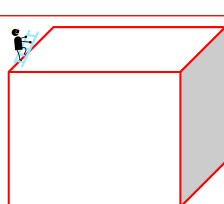
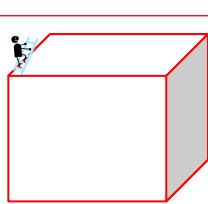
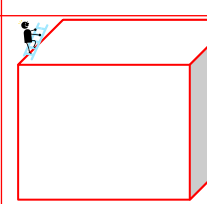
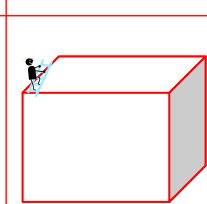
The line graph allows you to be able to easily see the change in time between states, as well as compare the volumes used by each state.. It is difficult to see the proportion of water used by each state using a line graph.



4. A kilolitre is the amount of water that would fill in one cubic metre (1m x 1m x 1m).

Using 2011-12 data for your own state or territory in table 1, show the total amount of water used as a cube with dimensions correct to 1 decimal place. For comparison draw a scale drawing of yourself next to the cube.



NSW	Vic.	Qld	SA
			
4.1 x 4.1 x 4.1 = 70m ³	3.8 x 3.8 x 3.8 = 56m ³	4.2 x 4.2 x 4.2 = 76m ³	4.2 x 4.2 x 4.2 = 72m ³
WA	Tas.	NT	ACT
			
4.8 x 4.8 x 4.8 = 110m ³	5.3 x 5.3 x 5.3 = 147m ³	4.1 x 4.1 x 4.1 = 69m ³	

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$5.0 \times 5.0 \times 5.0 = 127m^3$	$4.8 = 109m^3$	$5.3 = 145m^3$	$4.1 = 69m^3$
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Calculation of length of cube using total household water consumption (kL) per capita 2011-12

$$\begin{aligned} \text{E.g. NSW length} &= \sqrt[3]{219} \\ &= 4.1m \end{aligned}$$

5. Based on all the information, create a list of suggestions that will help reduce water use.

Look at reducing amount of water used outdoors. E.g. encourage use of mulch, native plants, water saving hose fittings.

Encourage the use of water saving products like dual flush toilets and water saving shower heads. E.g. subsidise the cost, legislate for new buildings

6

7 Extension

7.1

7.2 Task One

6. With a partner, list ways that water is wasted around the home. Suggest solutions to decrease this waste.

Answers will vary.

Examples of water waste include: choosing high water use appliances, wasting water when brushing teeth, waiting for hot water to come through the tap, running washing machine and dishwasher with less than a full load, rinsing vegetables under running water, inefficient watering in the garden.

To decrease this waste: choose water efficient appliances, turning off the tap when brushing teeth, collecting water when waiting for it to warm up in the shower, waiting for a full load before running dish washer and washing machines, rinsing vegetables with the plug in, installing drip systems and making sure that watering is done effectively e.g. in the cooler part of the day, and using mulch.

7.3

7.4 Task Two: Brushing Teeth

How much water is wasted per person in a year if they leave the tap running while they brush their teeth?

7. Complete steps 1 - 4 (below) as homework.

Step 1: Time how long it takes to brush your teeth in seconds. Call this tb.

tb = _____ seconds

e.g. tb = 180 seconds

Step 2: Time how long it takes to fill a 1 litre (L) container at your bathroom sink (please



use this water wisely). Call this t_f . (Hint: make sure you have the tap running at a normal flow)

$$t_f = \text{_____ seconds} \quad \text{e.g. } t_f = 20 \text{ seconds}$$

Step 3: Calculate the flow rate in L per second.

$$\begin{aligned} \text{Flow rate} &= 1/t_f & \text{e.g. flow} &= 1 \div 20 \\ &= \text{_____ L per second} & &= 0.05 \text{ litres/} \\ & & & \text{second} \end{aligned}$$

Step 4: Calculate the water wasted by multiplying the flow rate by the time it takes to brush your teeth.

$$\begin{aligned} \text{Water wasted} &= t_b \times \text{flow rate} & \text{e.g. waste} &= 180 \times \\ & & & 0.05 \\ &= \text{_____ L} & &= 9 \text{ litres} \end{aligned}$$

Questions

8. If a person brushes their teeth twice a day and leaves the tap running while doing so, calculate how much water will be wasted over a week, a month and a year? Do the same calculation for a family of four.

Using the figures above 180s is 2.5min

$$\begin{aligned} \text{Water wasted in 1 week} &= 2 \times 2.5 \times 7 \\ &= 35 \text{ litres} \end{aligned}$$

$$\begin{aligned} \text{Water wasted in 1 month} &= 4 \times 35 & \text{or} & \text{Water wasted in 1 month} \\ &= 35 \times 52 \div 12 & & \\ &= 140 \text{ litres} & &= 152 \end{aligned}$$

litres

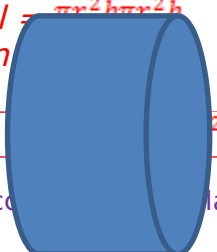
$$\begin{aligned} \text{Water wasted in 1 year} &= 35 \times 365 \\ &= 12,775 \text{ litres} \end{aligned}$$

9. Using the same volume as in question 4, calculate the possible dimensions of the following prisms that would hold the same amount: a cylinder, a rectangular prism of height 0.5m, an oval based prism with a base area of 2.8m^2 . Draw a diagram for each prism showing the dimensions and also clearly show your calculations.

The following calculations show the calculations for NSW in 2011-12, using a volume of 70m^3

a) a cylinder.	b) a rectangular prism height is 0.5 m	c) oval based prism base is 2.8 sq m
$\text{Vol} = \pi r^2 h$ 4m 70	$\text{Vol} = l \times w \times h$ 0.5 70	$\text{Vol} = \text{area of base} \times h$ $A = 2.8$ 70
$r = 2.4\text{m}$ $h = 4\text{m}$	$h =$ $70 = l \times w \times 0.5$	$70 = 2.8 \times h$

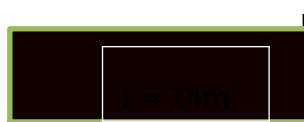
Acc



$h = 4\text{m}$

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$w =$
 10m



Page 5 of 6
Area of
base =
 2.8m $h = 25\text{m}$



$\frac{4}{70} = \pi r^2 \pi r^2$ $\frac{17.5}{\pi \pi} = r^2 r^2$ $r = 2.4m$	$\frac{140}{\div 0.5} = l \times w$ ANS: any two numbers with a product of 140 e.g. $l = 14m, w = 10m$	$\frac{2.8}{h} = 25m$
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